

FIG. 1

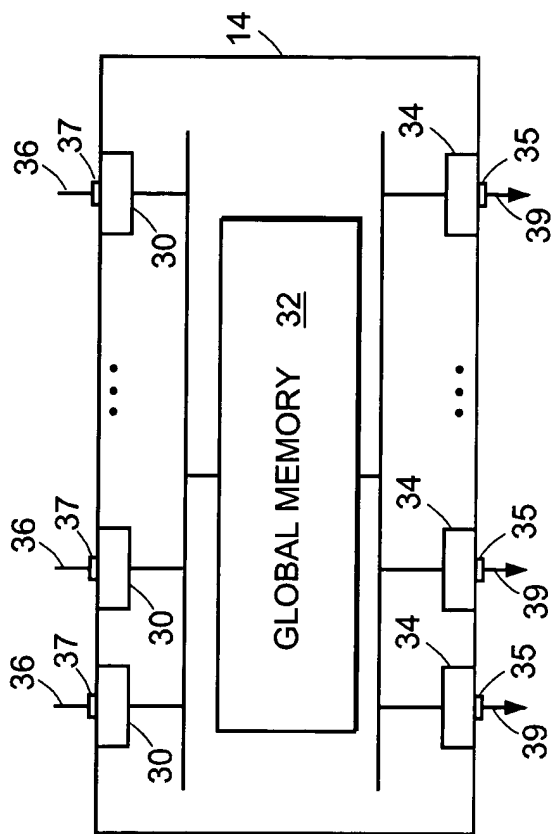


FIG. 2

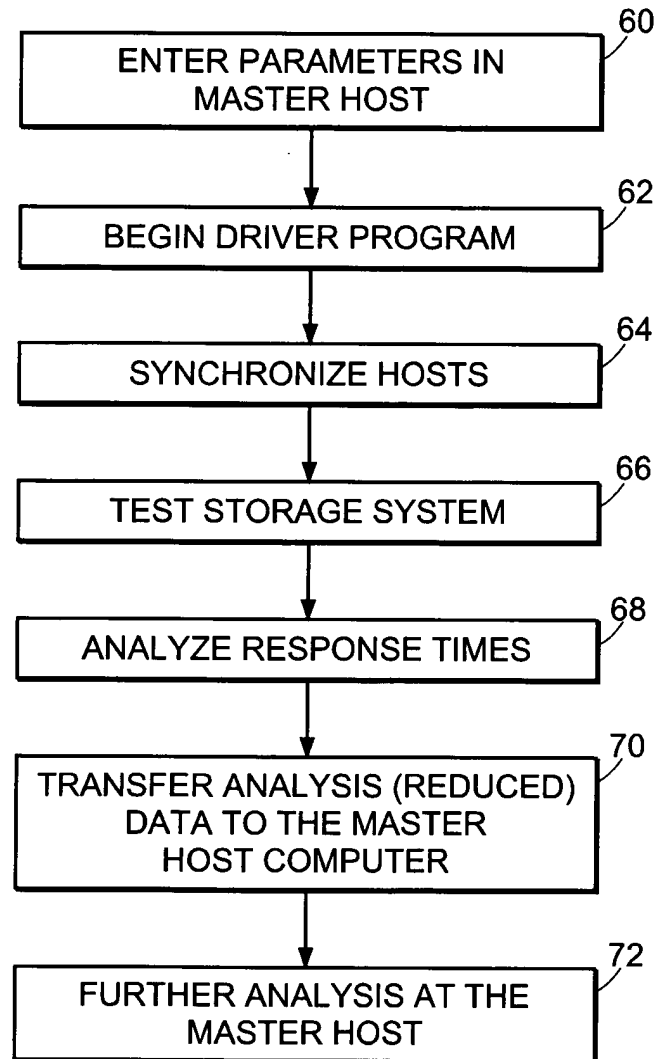


FIG. 3

FIG. 4A
FIG. 4B

FIG. 4

REQUIRED	NUMBER OF LOGICAL DISKS
	NUMBER OF "CHILD" PROCESSES TO START
	NUMBER OF CAPTURE RESPONSE TIMES
	NUMBER OF RESPONSE TIMES
	BUFFER SIZE
	OFFSET SIZE
	MAXIMUM RANGE
	TIME OF TEST
	READ/WRITE SIZE
	READ/WRITE MIX

FIG. 4A





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OPTIONAL	ID OF DEVICES BEING TESTED
	ID OF MASTER & CLIENT HOSTS
	I/O TYPE (SEQUENTIAL OR RANDOM)
	NUMBER OF I/O OPERATIONS PERFORMED TO CORRECT OFFSET
	DISPLACEMENT FROM OFFSET
	DELAY BETWEEN COMMANDS
	INITIAL BYTE OFFSET
	NUMBER OF SEEKS FOR RANDOM I/O
	DATA REDUCTION METHOD
	ICDA PERCENT HIT RATE

FIG. 4B

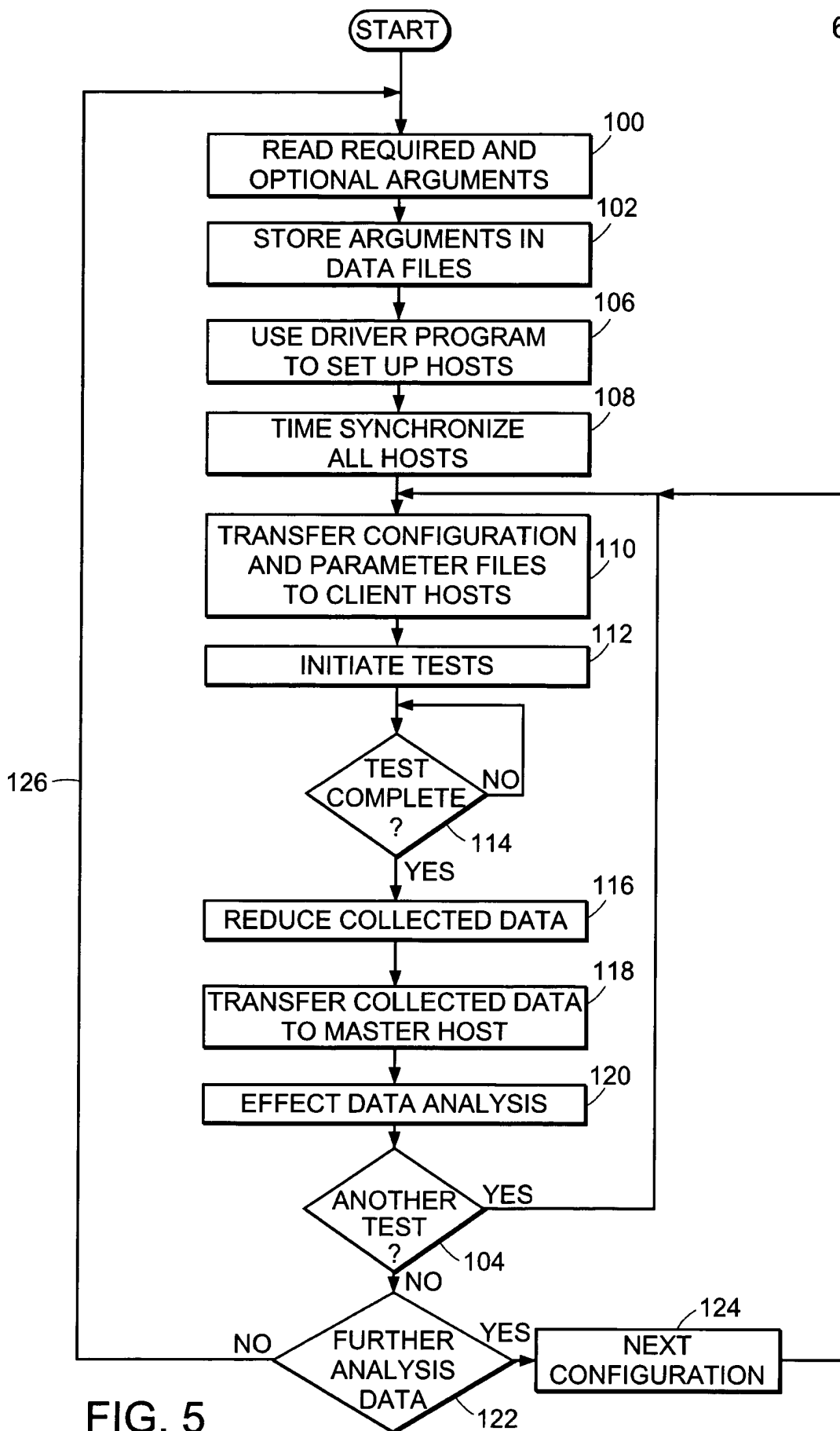


FIG. 5

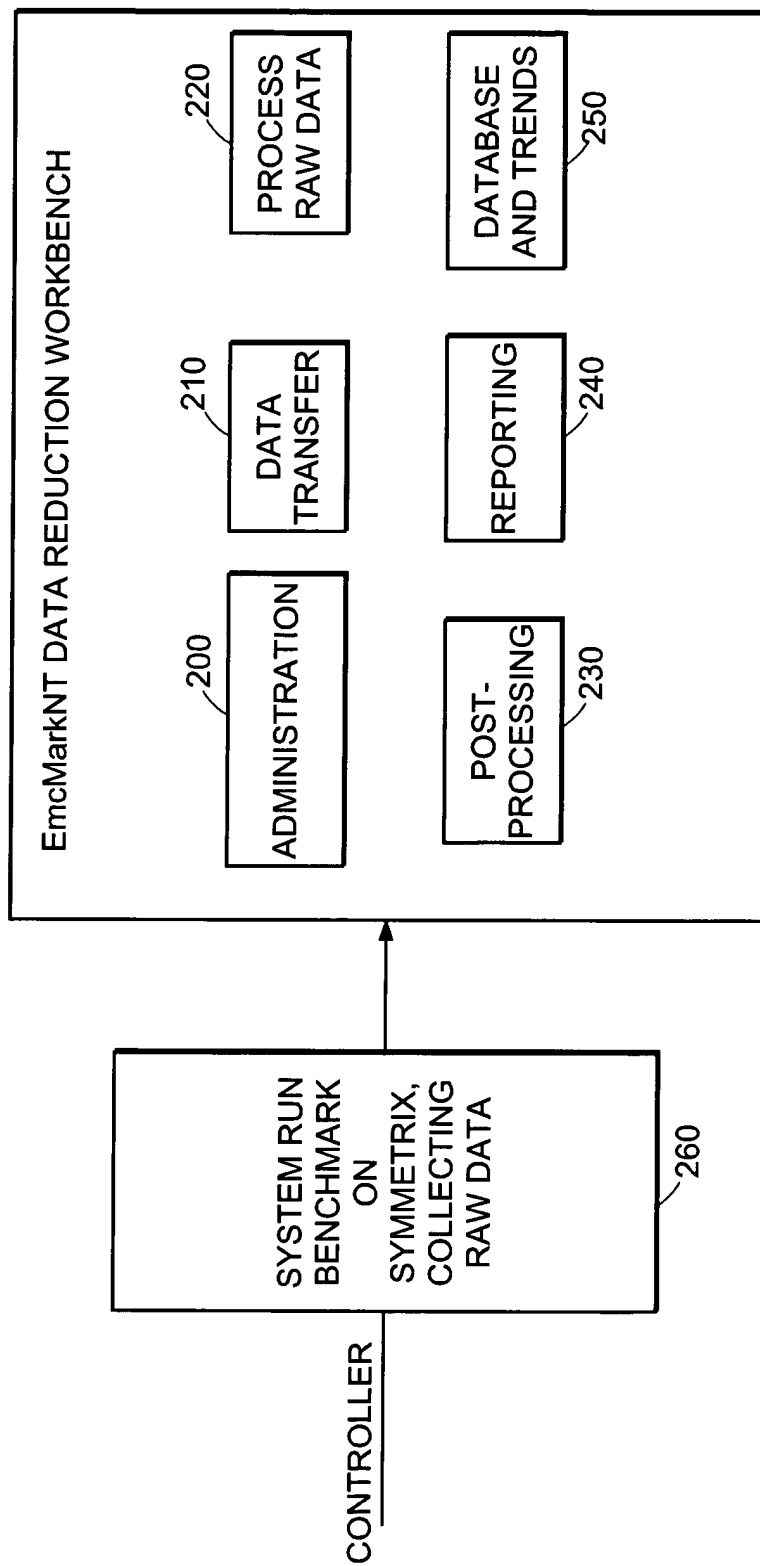


FIG. 6

EmcMarkNT DATA REDUCTION WORKBENCH FLOW

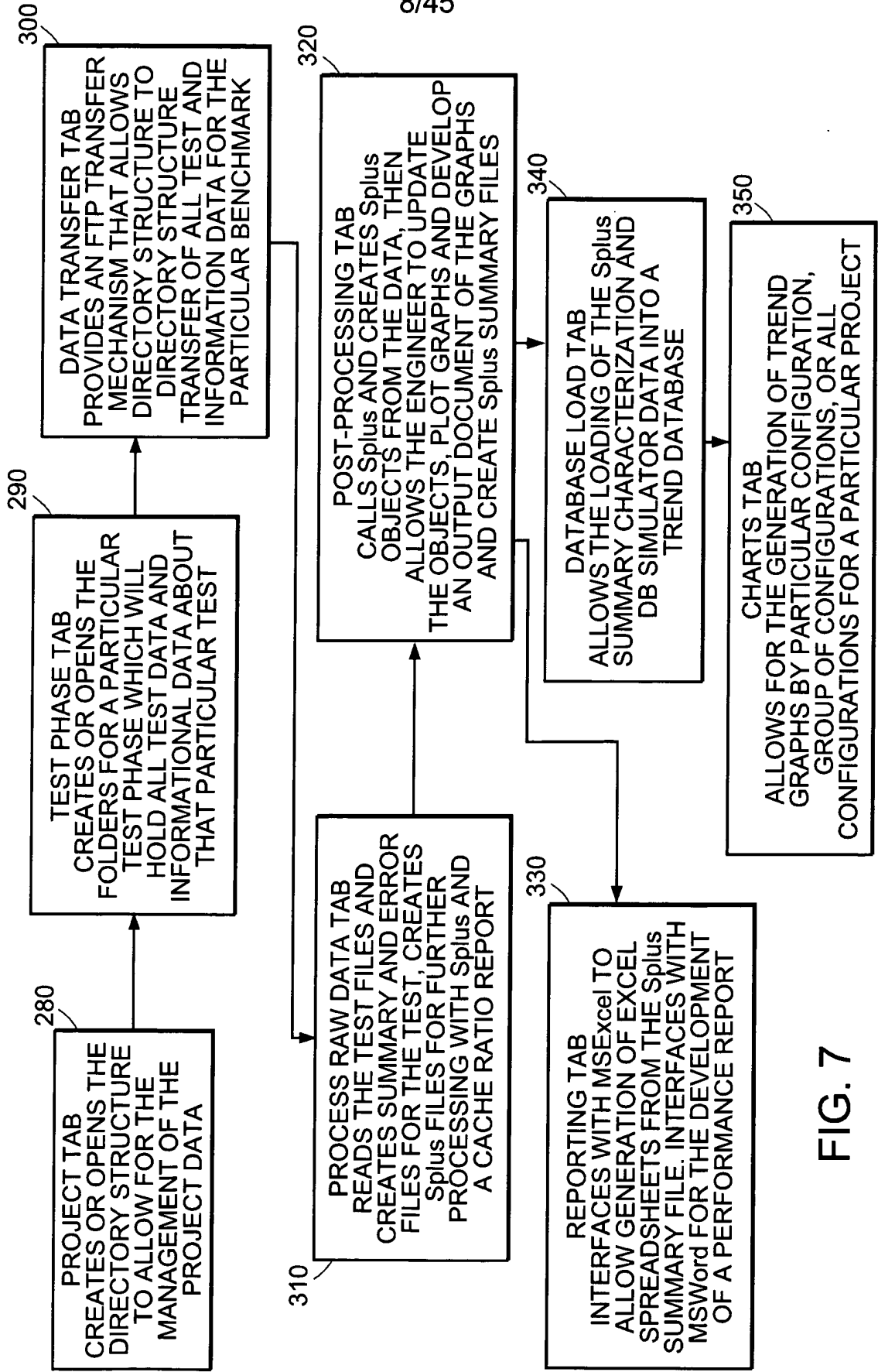
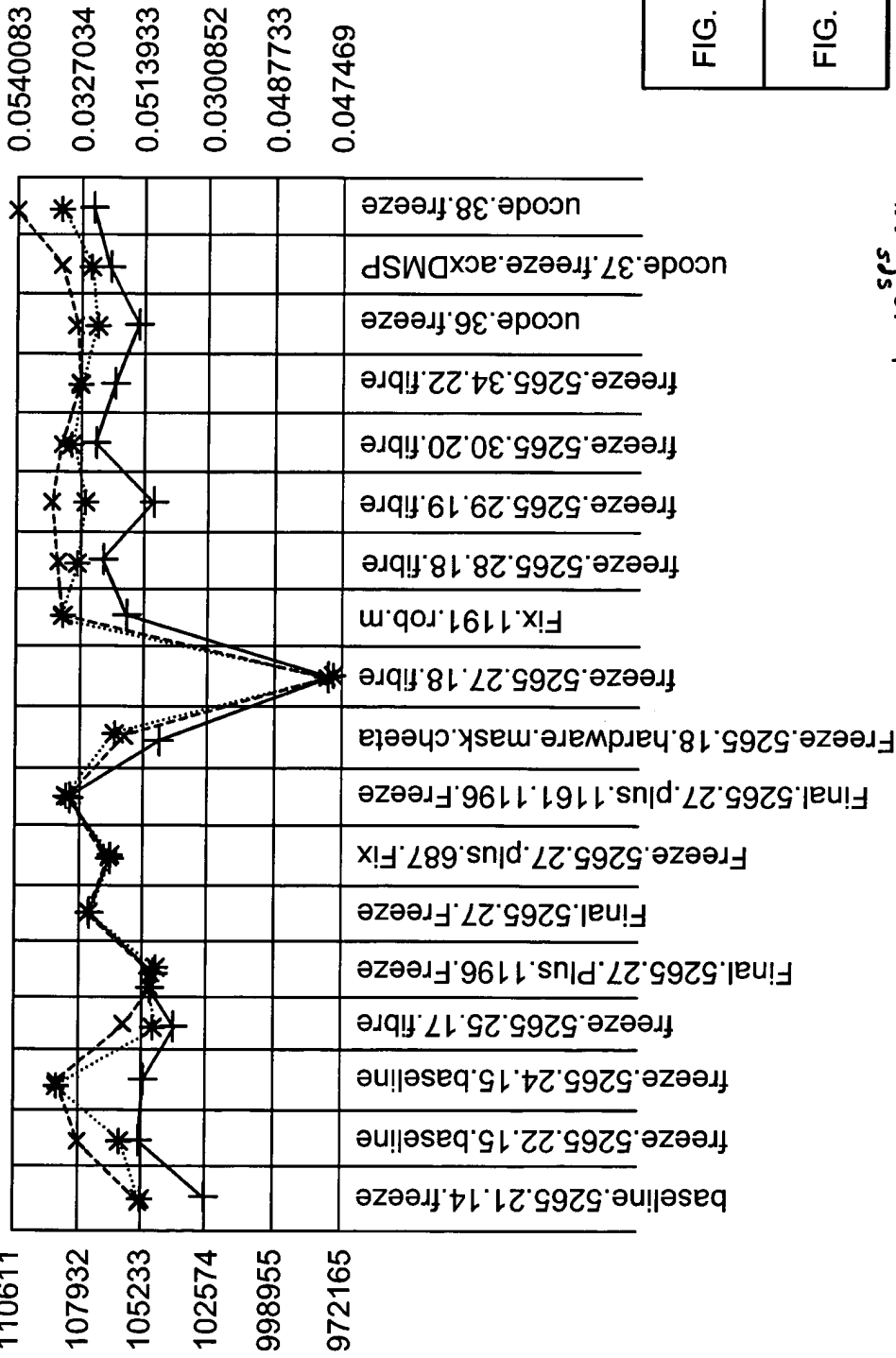


FIG. 7





IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512



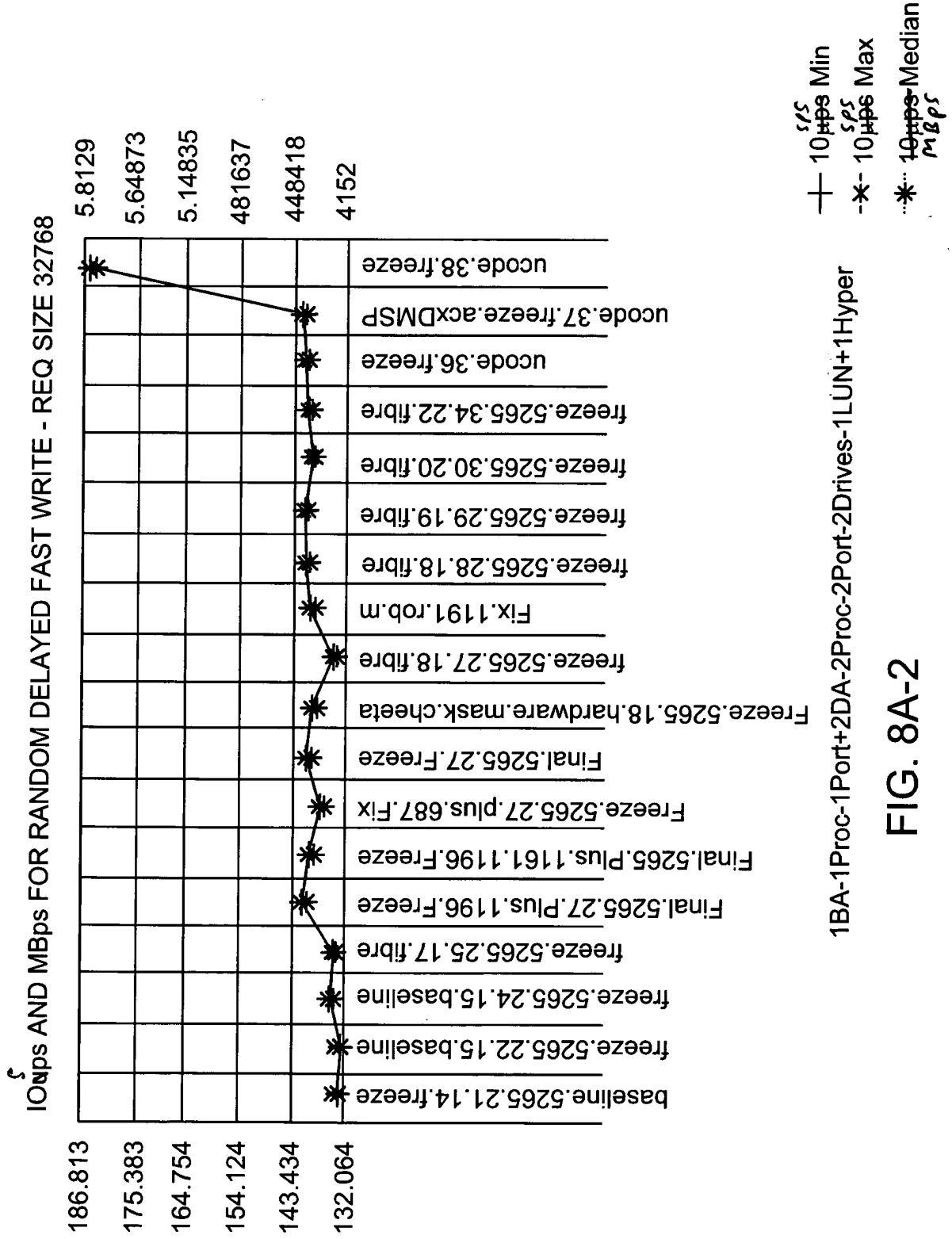
10MBps Min  
10MBps Max  
10MBps Median

1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

FIG. 8A-1

FIG. 8A-1	FIG. 8A-2
FIG. 8A-3	FIG. 8A-4

FIG. 8A



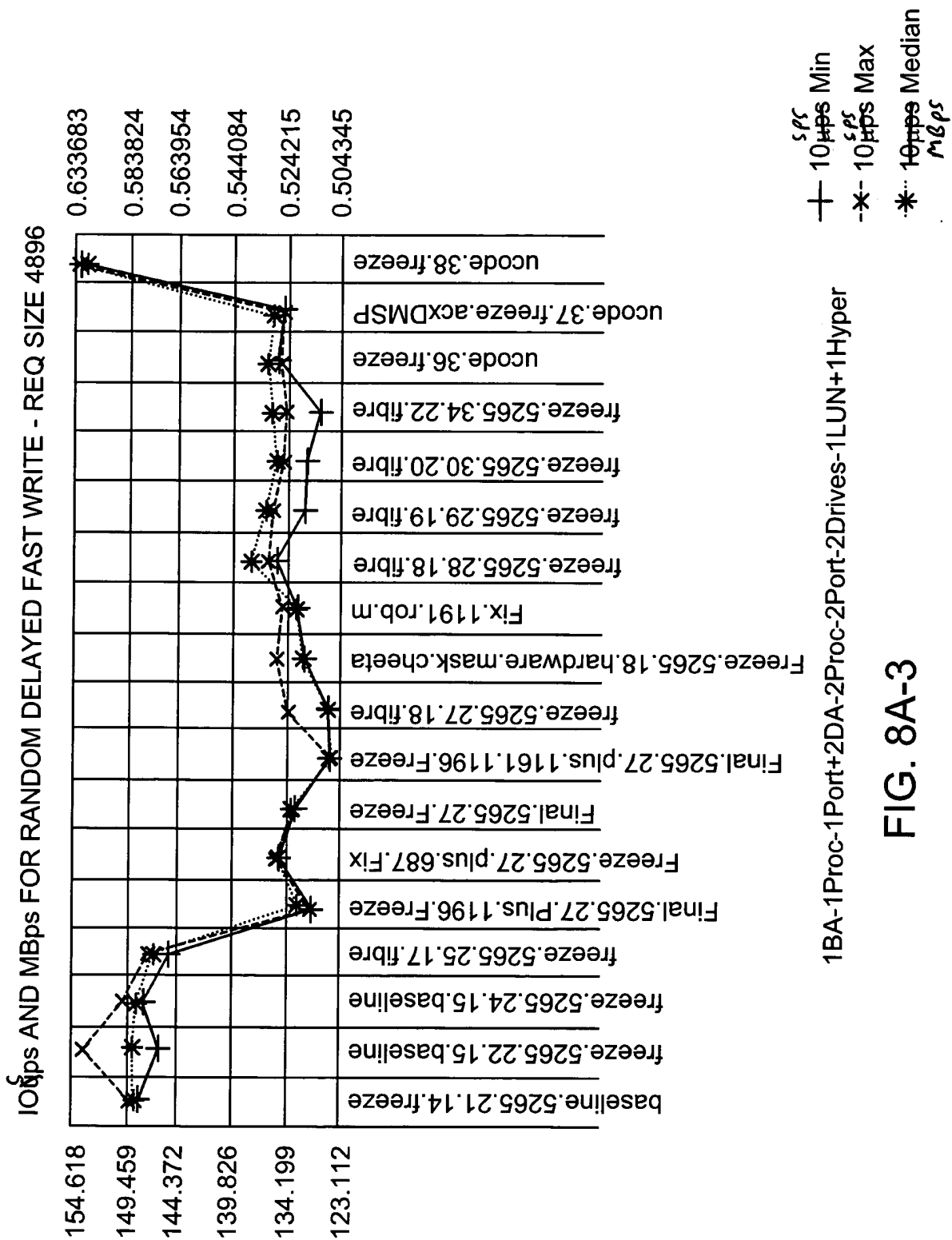
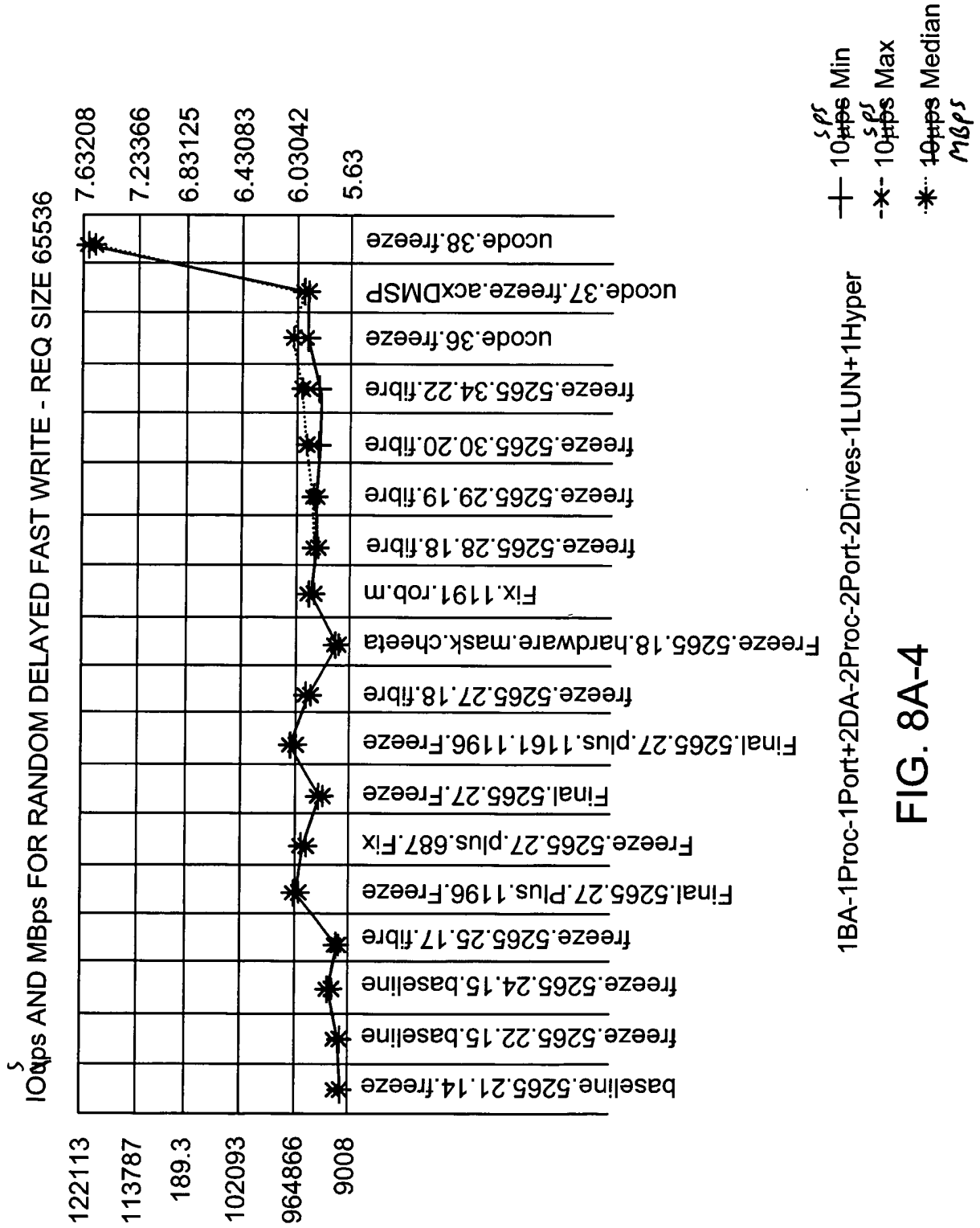


FIG. 8A-3



# IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512

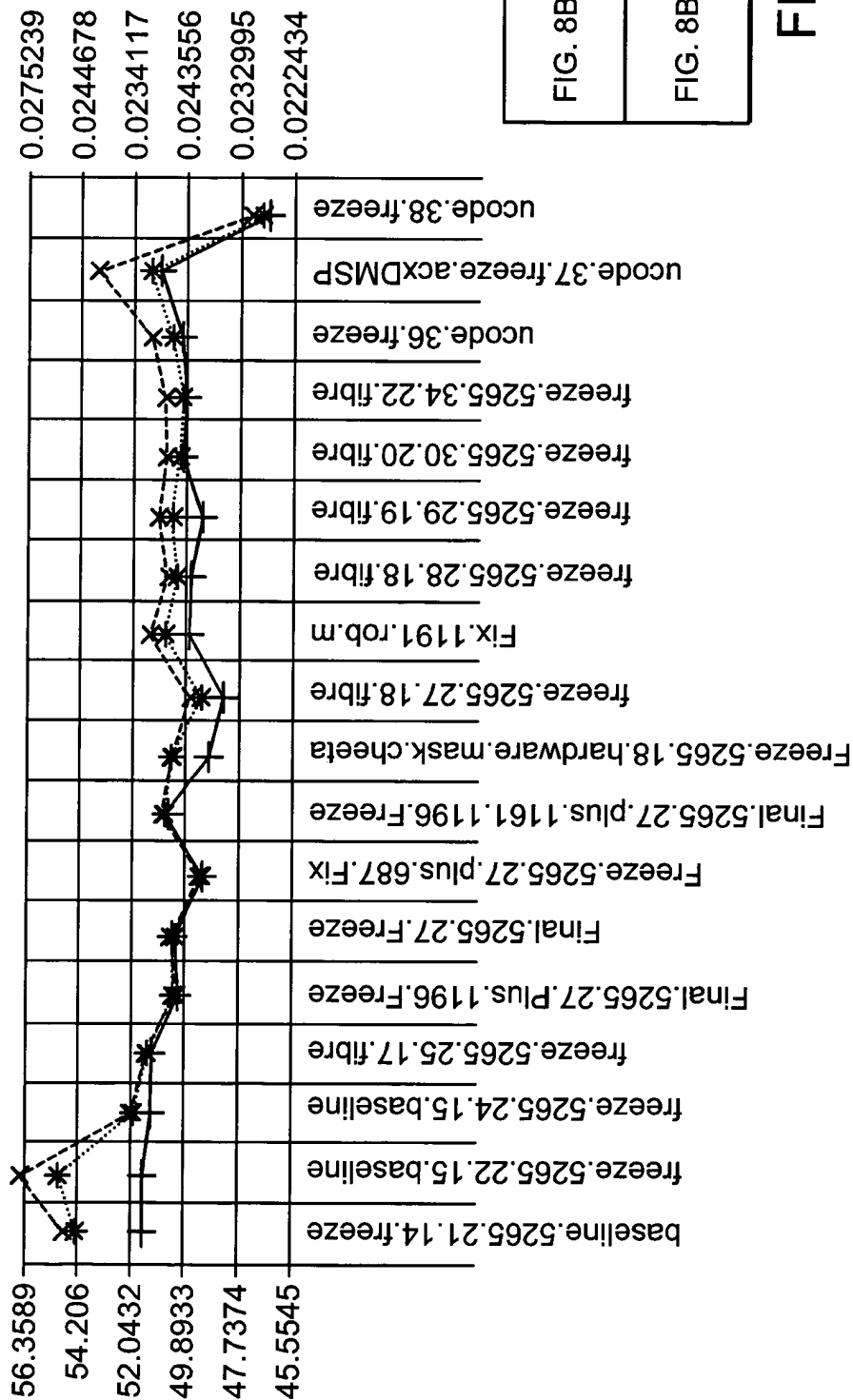
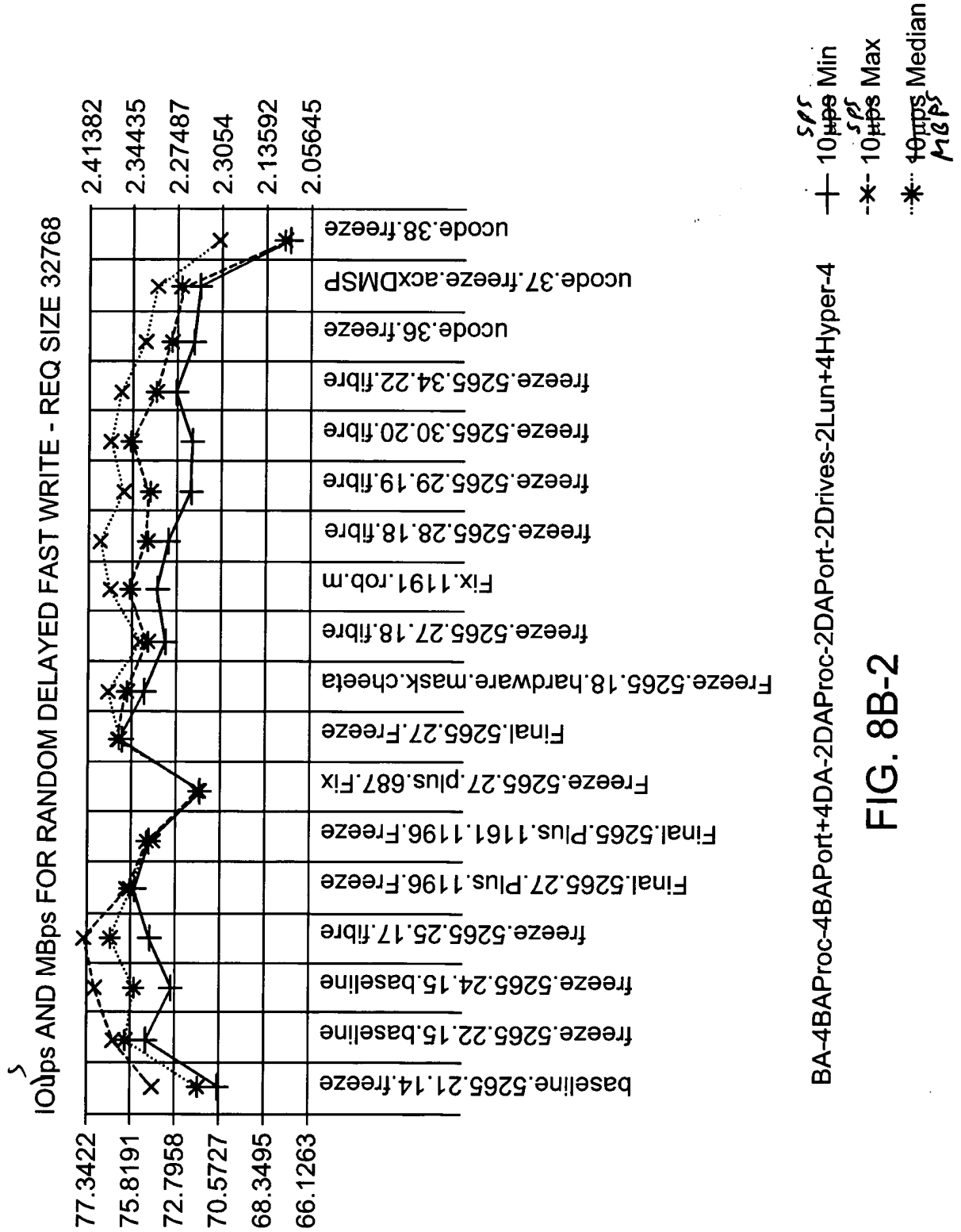


FIG. 8B-1	FIG. 8B-2
FIG. 8B-3	FIG. 8B-4

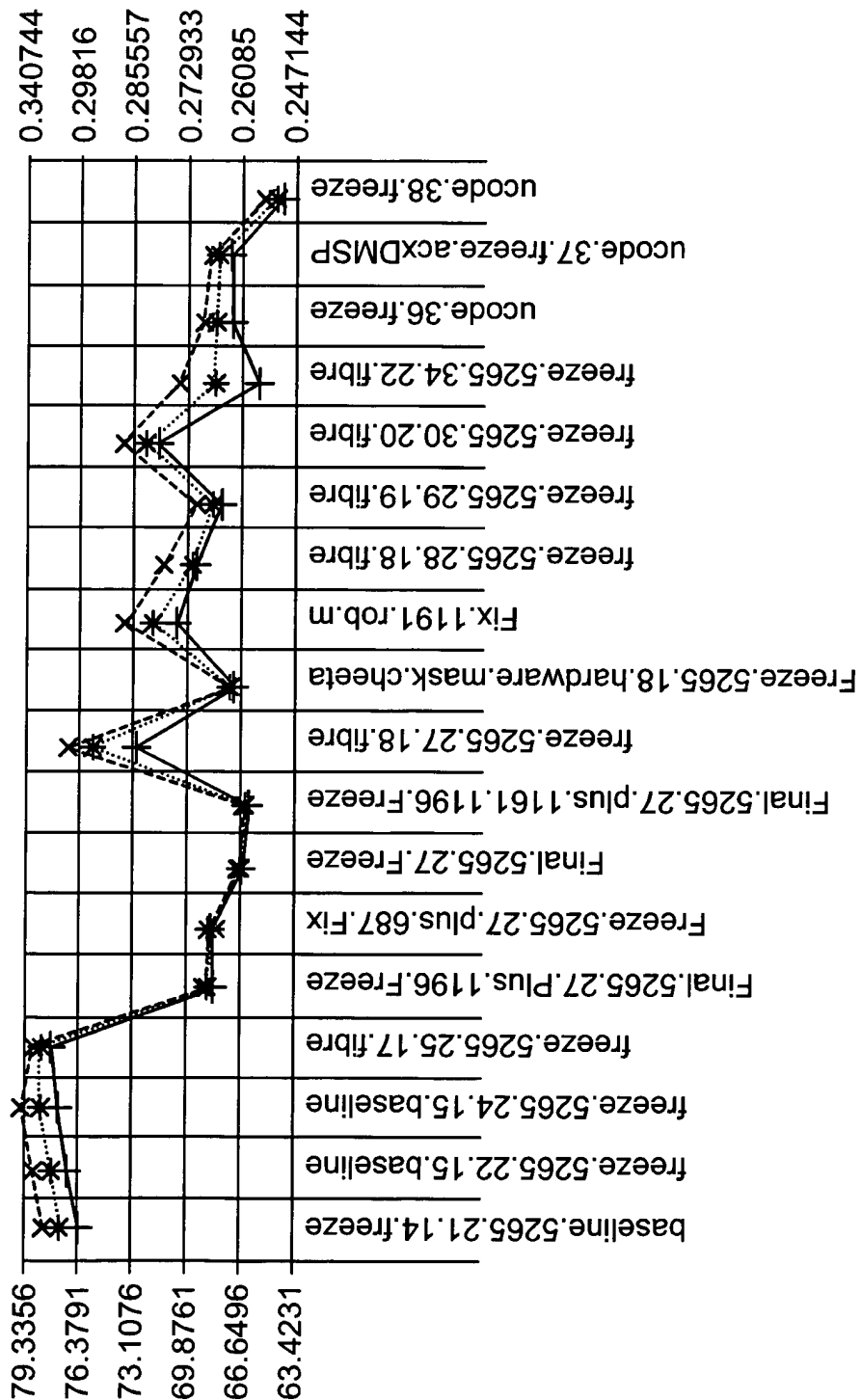
FIG. 8B

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4  
 10µps Min  
 10µps Max  
 10µps Median  
 MBps

FIG. 8B-1



IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4096

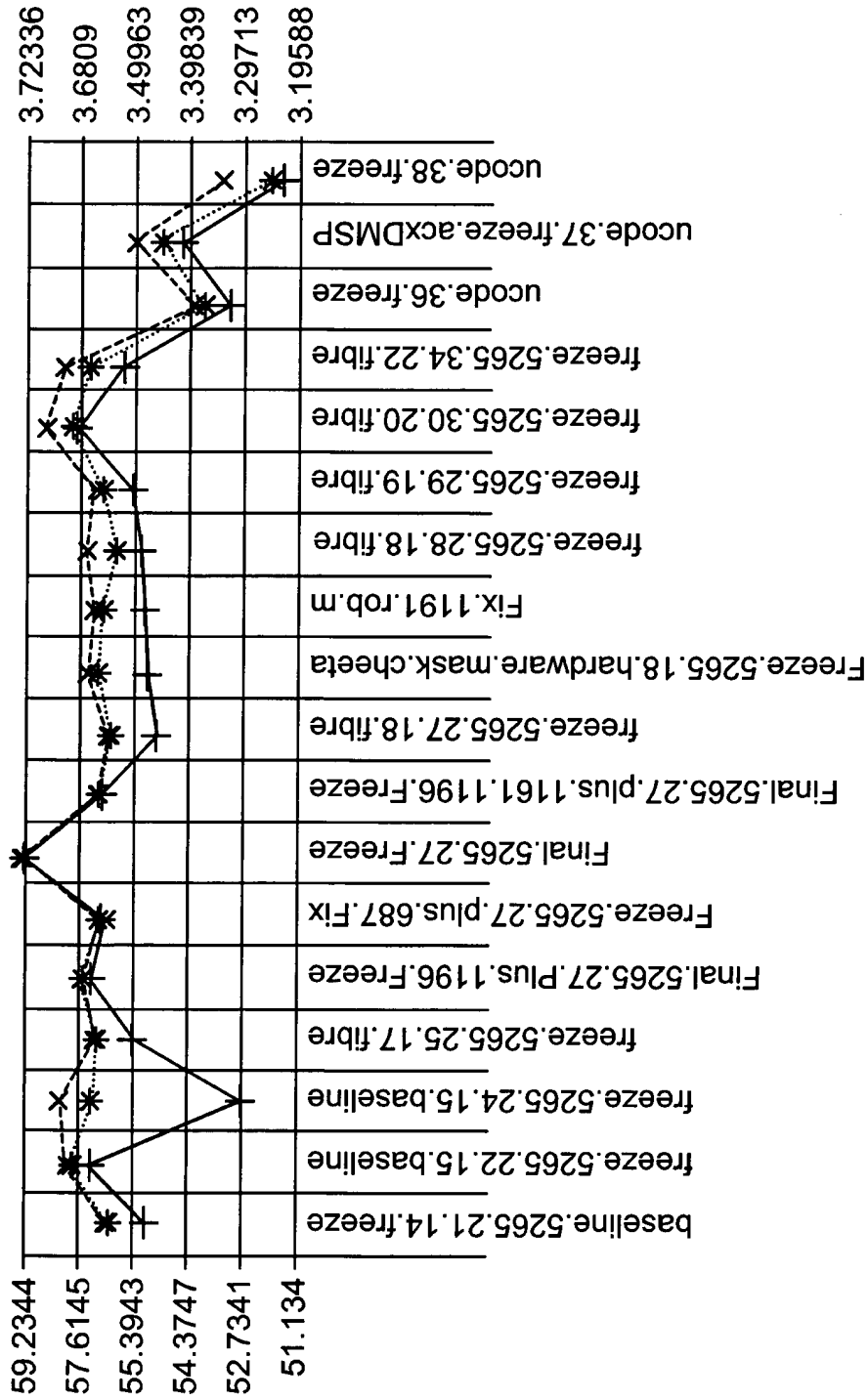


10µps Min  
 10µps Max  
 10µps Median  
 10µps Avg

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-3

IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536



10MBps Min  
 10MBps Max  
 10MBps Median  
 10MBps

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-4



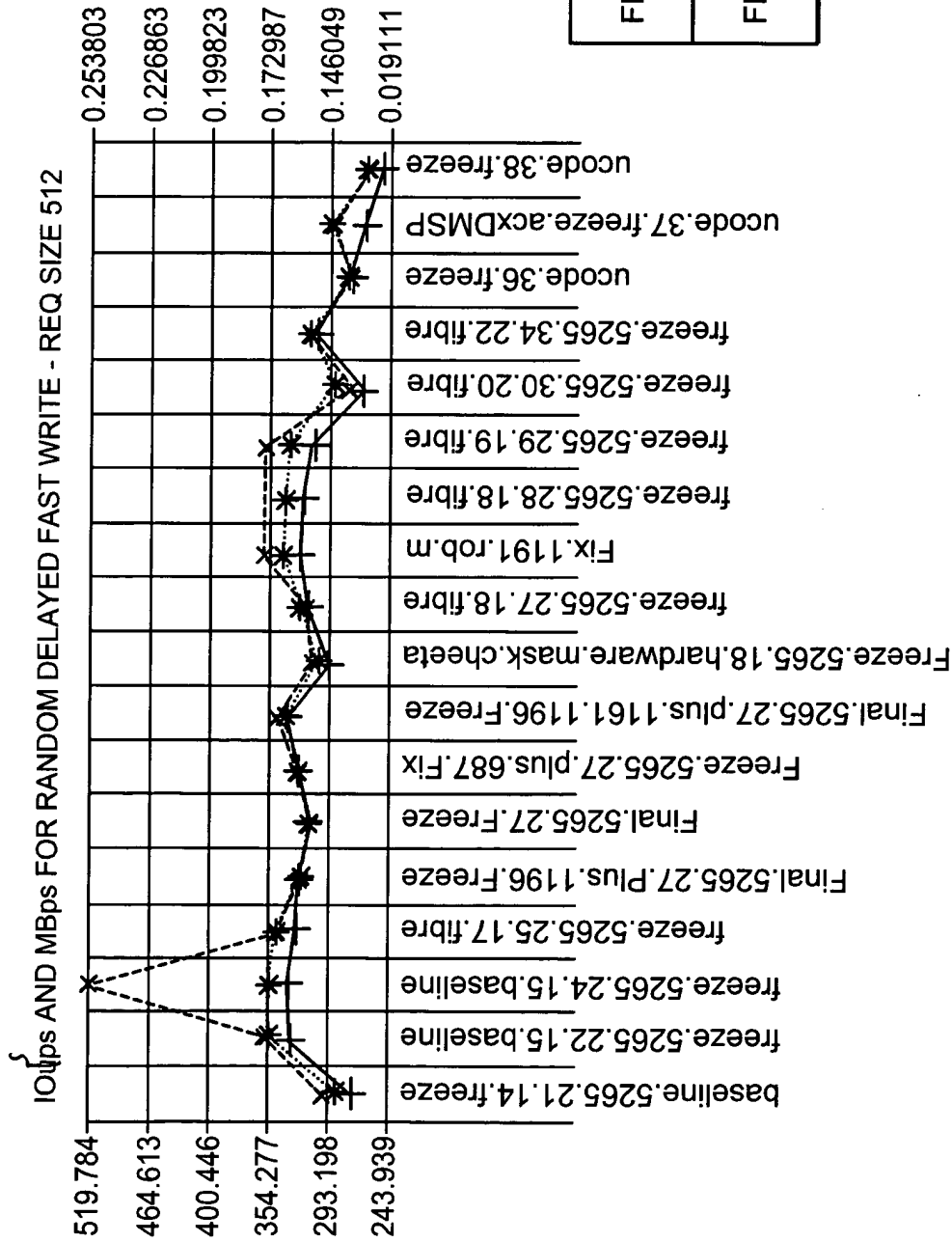
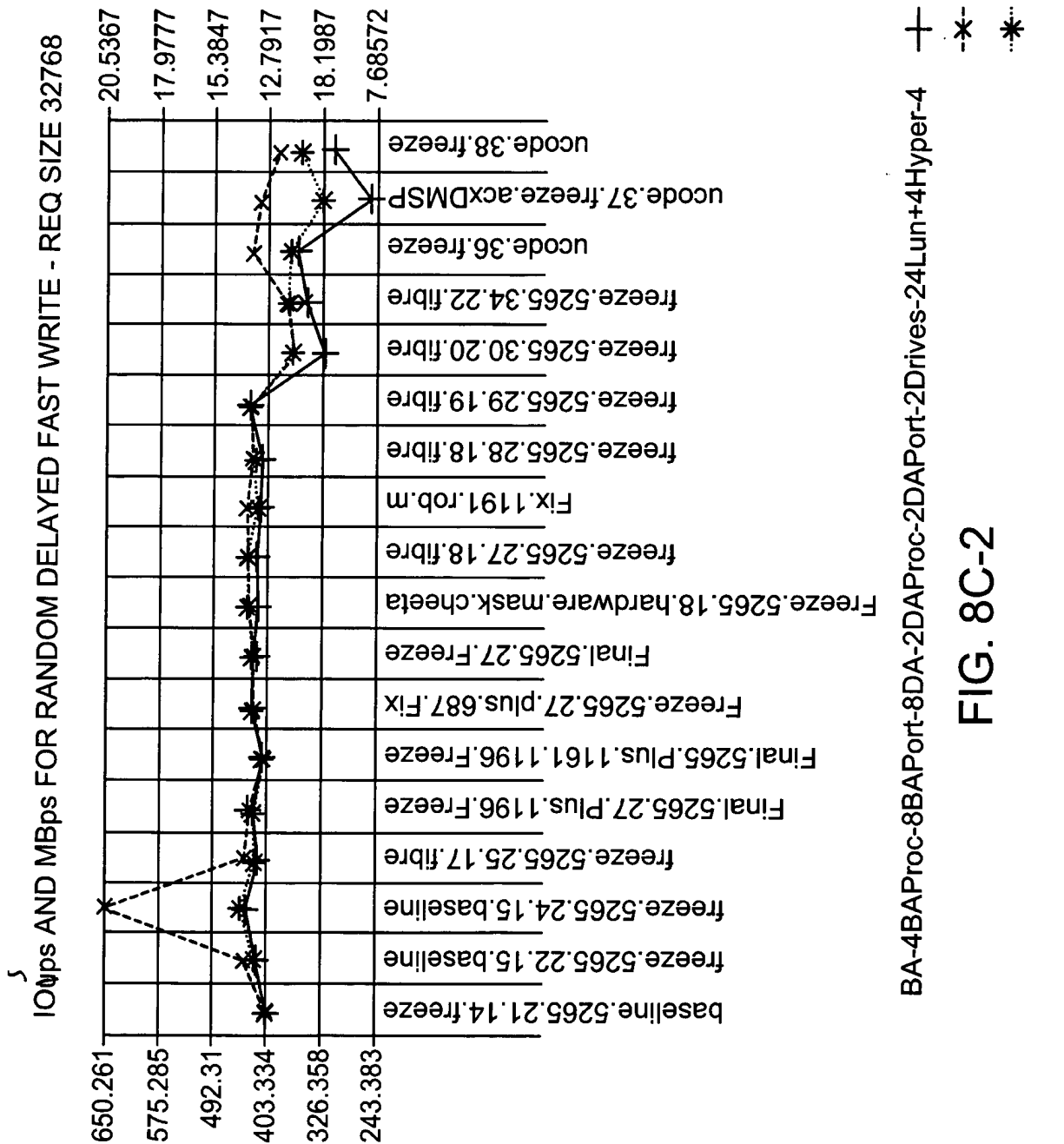


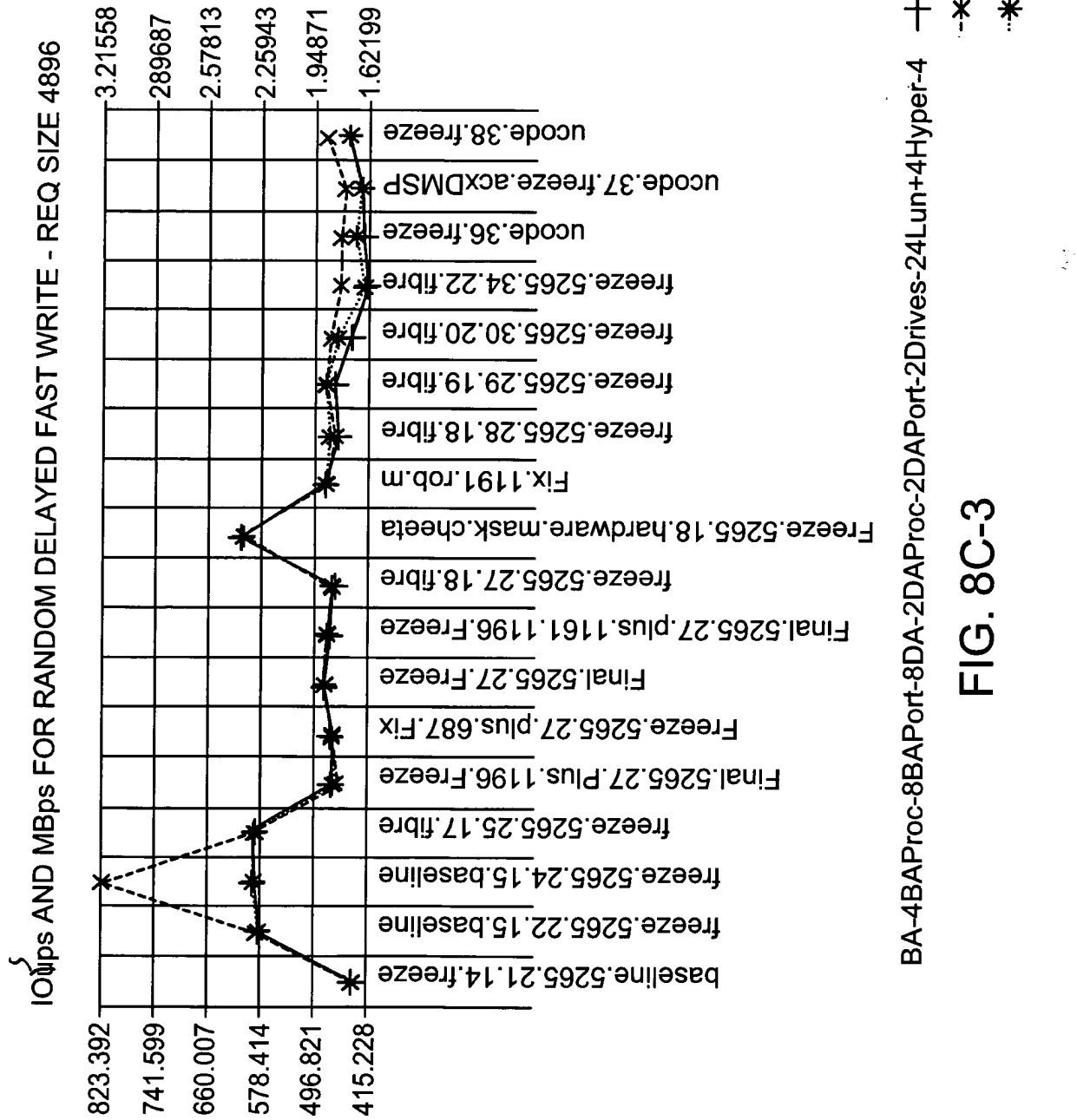
FIG. 8C-1	FIG. 8C-2
FIG. 8C-3	FIG. 8C-4

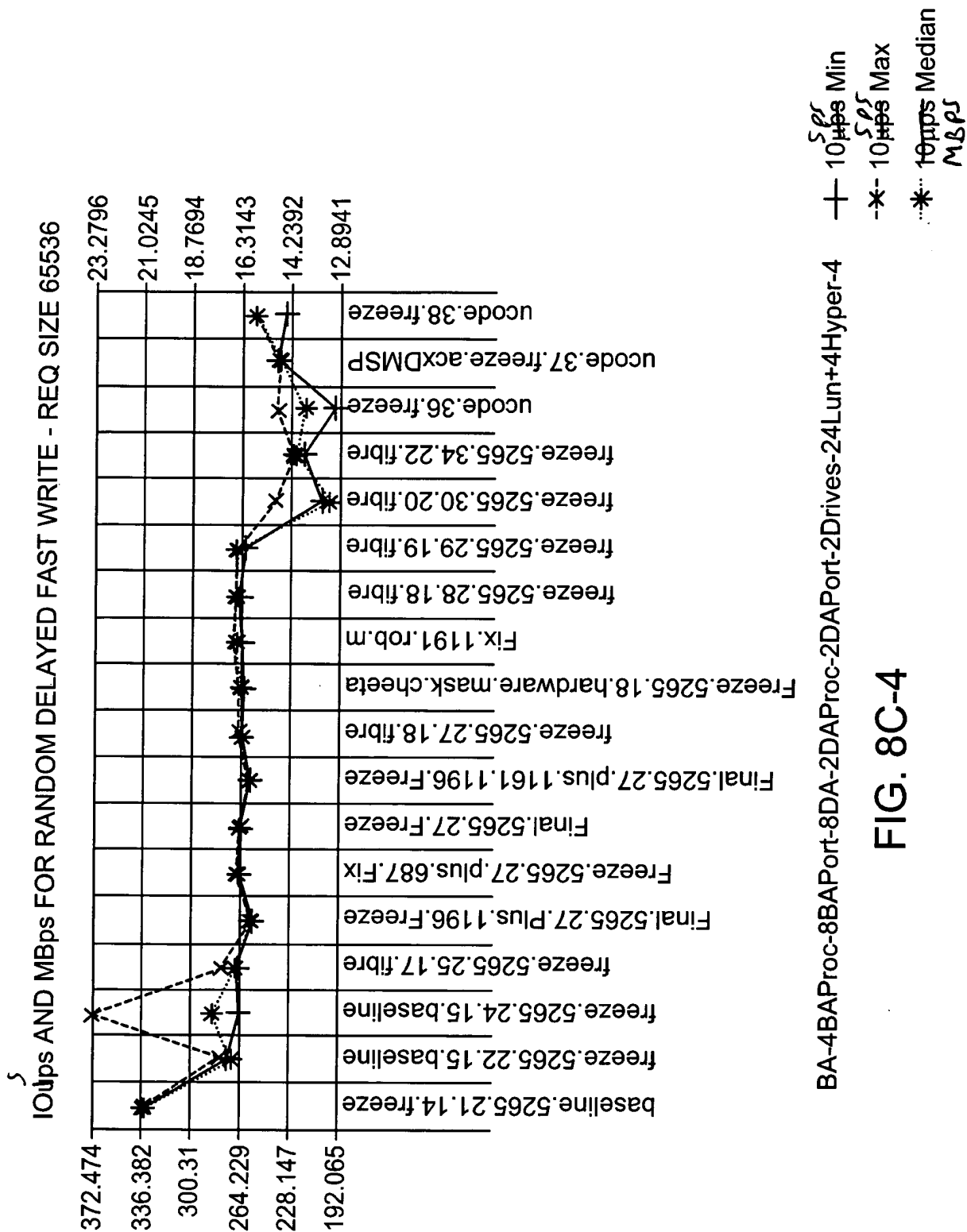
FIG. 8C

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4  
 Sps  
 + 10 Sps Min  
 - 10 Sps Max  
 \* 40 Sps Median  
 MBps

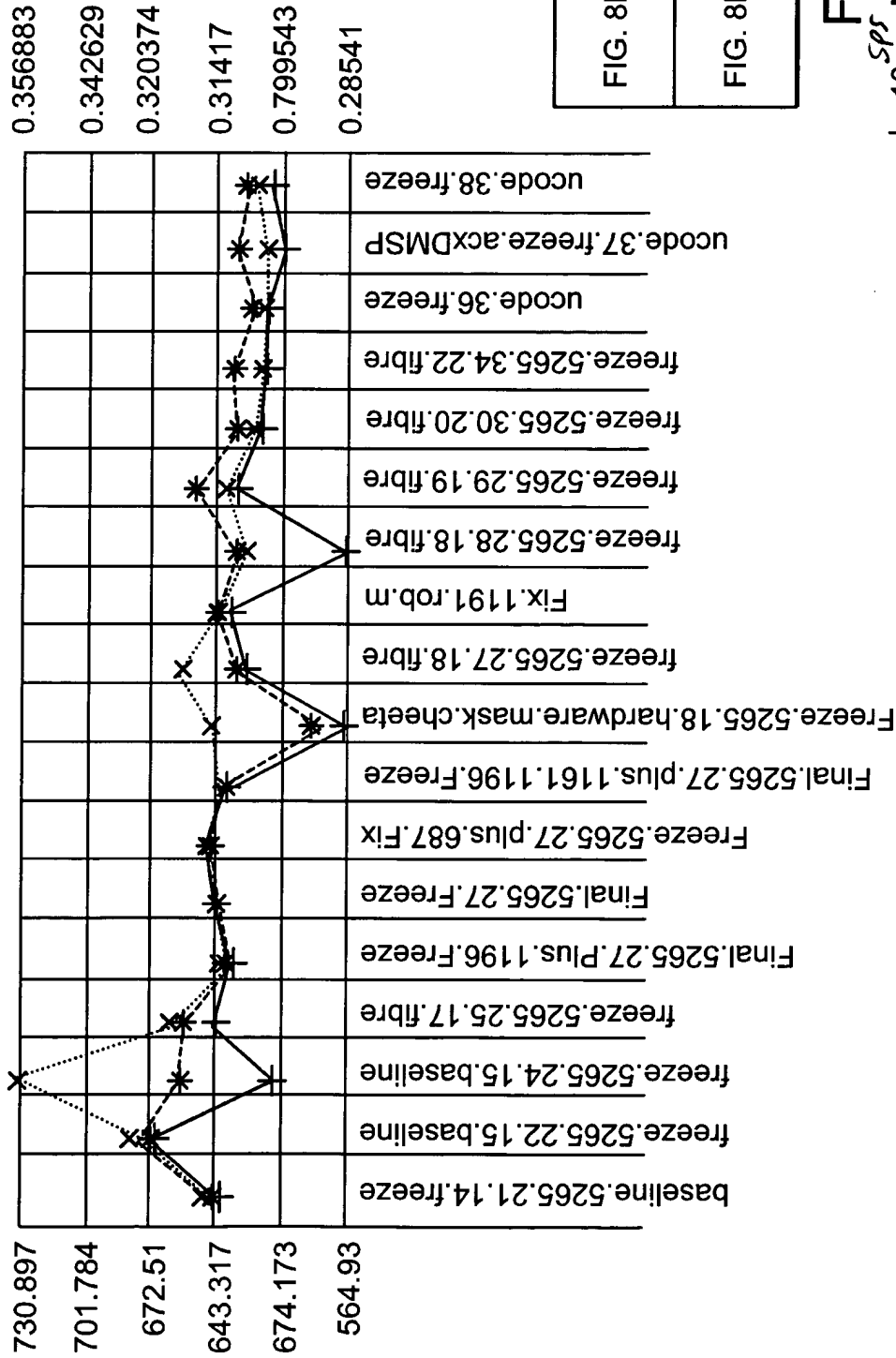
FIG. 8C-1







# IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512



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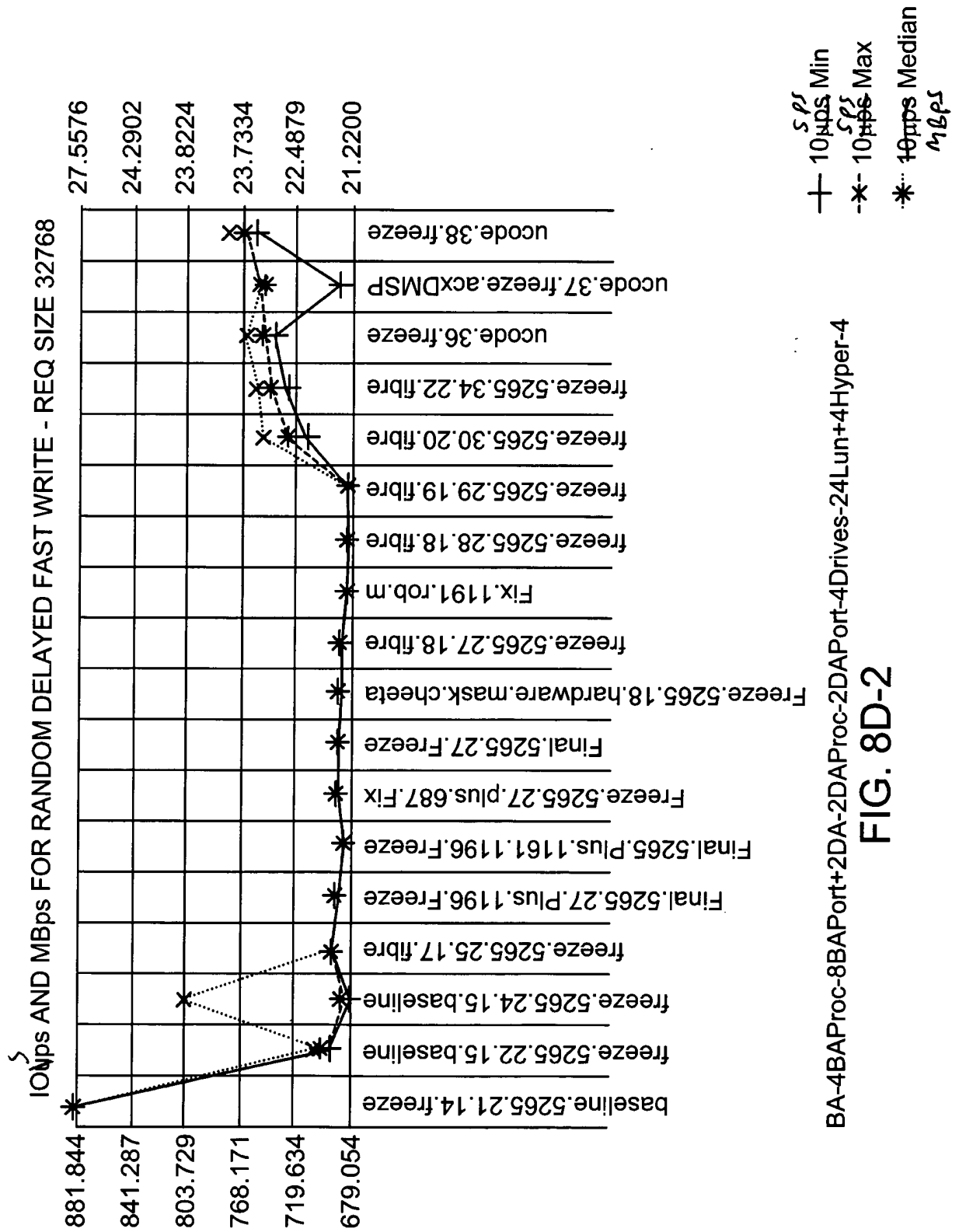
FIG. 8D-1	FIG. 8D-2
FIG. 8D-3	FIG. 8D-4

FIG. 8D

+ 10pps Min  
 \* 10pps Max  
 \* 10pps Median  
 MBps

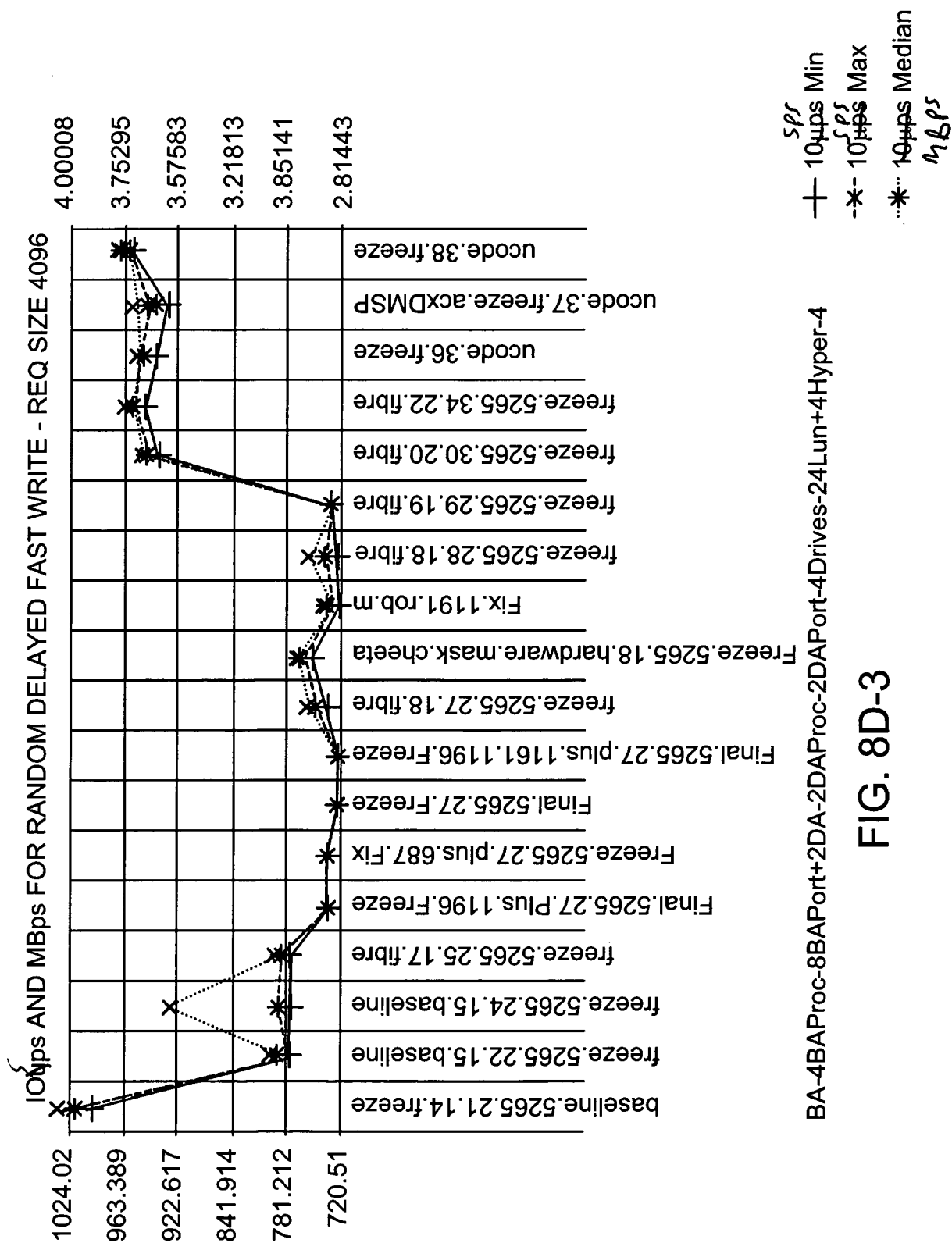
BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

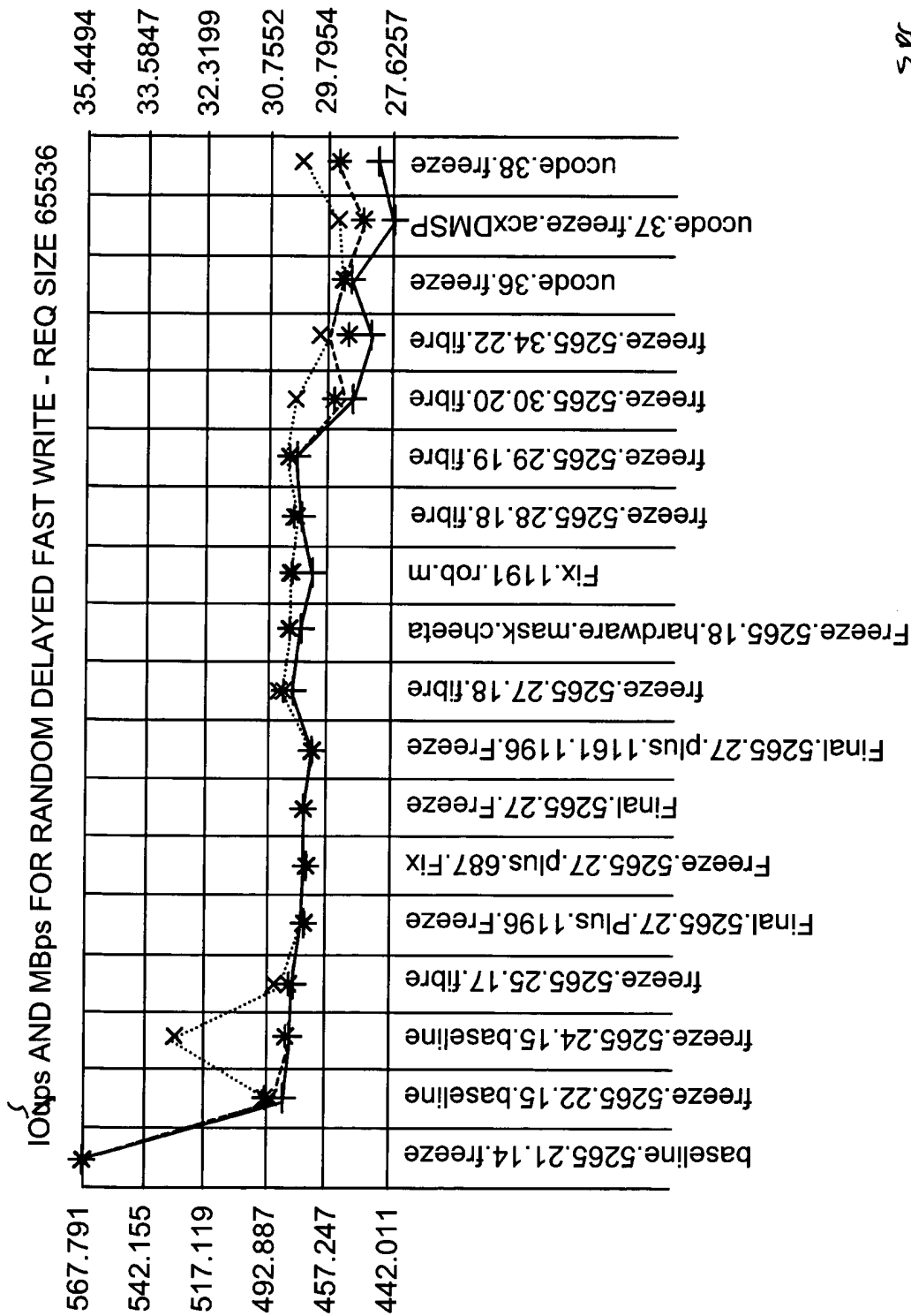
FIG. 8D-1



BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

FIG. 8D-2





+ 10µps Min  
 \* 10µps Max  
 x Median

BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

FIG. 8D-4





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POST PROCESSING TAB  
THE POST PROCESSING TAB CREATES OBJECTS, PLOT GRAPHS AND GENERATES SUMMARY  
FILES USING THE Splus DATA ANALYSIS SOFTWARE.

Emc MarkNT

File Edit Project Log View Help

Project Test Phase Data Transfers Process Raw Data Post-Processing Reporting Database Lead

Post Processing

Characterization

Create Object

Update Object

Plot Graphs

View Graphs

Generate Summary

View Summary

Database Simulator

Create Object

Plot Graphs

View Graphs

Generate Summary

View Summary

Splus

Start SPlus

Close SPlus

View Style

☐ 2 Graphs/Page

☐ 8 Graphs/Page

☒ 12 Graphs/Page

☐ 15 Graphs/Page

MetaNT\Fibre.EmulexA 6/8/99 11:36 AM

FIG. 9

SYMMETRIX CONFIGURATION VIEW

Emc MarkNT Performance Characterization W

File Actions View Help

☐

Symmetrix Configuration

☒ Physical Device    ☐ Symmetrix Device

CPQ01	000183500055
CPQ02	000183500055

Hostname CPQ01

Add Remove Refresh

Emc MarkNT Performance Characterization W

File Actions View Help

☐

Symmetrix Configuration

☒ Physical Device    ☐ Symmetrix Device

CPQ02	000183500055
FA-1A	DA-2A
DA-3A	FA-5A
FA-12A	DA-14A
DA-15A	SA-16A
FA-1B	DA-2B
DA-3B	FA-5B
FA-12B	

Hostname CPQ01

Add Remove Refresh

Emc MarkNT Performance Characterization W

File Actions View Help

☐

Symmetrix Configuration

☒ Physical Device    ☐ Symmetrix Device

DA-2B	DA-3B
FA-5B	FA-12B
DA-14B	DA-15B
SA-16B	IPHYSCALDR
	IPHYSCALDR
	IPHYSCALDR
	IPHYSCALDR
	IPHYSCALDR
	IPHYSCALDR

Hostname CPQ01

Add Remove Refresh

FIG. 9A



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# DEVICE DETAIL

Device Details

Symmetrix

Vendor Id: EMC

Product Id: SYMMETRIX

Symmetrix Id: 000183500055

Director: SA-16B

Port Number: 1

TID: 0

LUN: 0

Hyper Count: 2

Device Detail

Symmetrix Device: 000

Physical Device: \\.\PHYSICALDRIVE0

Logical Device:

Serial Number: 55000321

Device Status: Ready

Block Size: 512

Capacity: 7741440

Cylinders: 8064

Emulation: FBA

Mirror Policy: two-way mirror

Flags

☐ CKD

☒ META Head

☐ ASSOC

☐ VCM

☐ Mixed

☐ PowerPath Parent

☐ PowerPath Child

☐ PowerPath Sibling

☐ No channel

☐ RDF

☐ BCS

☐ BCV

☒ META

OK

FIG. 9B

SYMMETRIX DETAILS

Director Details

Symmetrix

Director:FA-1A

Director Type:Fibre Adapter

Director Num:1

Slot Num:1

SCIS Width:N/A

Num Ports:1

Port 0 status:On

Port 1 status:N/A

Port 2 status:N/A

Port 3 status:N/A

OK

FIG. 9C

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

cpq01

000183500055

Hostname: cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results Other

Definition

Project

Project Name: Bison.Roland

Test Phase: Full.Box.110199.Test

Test Description:

Storage Array

Storage Array: Symmetrix ☒ Symmetrix 4.6

Model: 3830 Code: 5265

Serial #: 000183500055 Code Date: 06231999

Details

Raid Type: Auto Hyper Policy: Auto

Mirror Policy: Auto Cache Size: 8GB

Physical Disks: 96 96 Disk Type: Auto

FIG. 9D

ENVIRONMENT TAB

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

cpq01

+ 000183500055

Hostname cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Environment

Master Host Directories

Tools Directory: /bench/EMCtools

Work Directory: /bench/work

Gateway:

Flags

DMSF

☒ Auto ☐ On ☐ Off ☐ Ignore

Flush Cache

☒ IMPL Reset (\$FDCE)

Trace

☒ Ignore ☐ Stop ☐ Clear ☐ CKD

Defaults

Maximum Block Size 128 k

Block Sizes

☒ 512 ☐ 1024 ☐ 2048 ☐ 4096 ☐ 8192 ☐ 16384

FIG. 9E

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device

☐ Symmetrix Device

cpq01

000183500055

Hostname

cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Workload Specification

Workload Execution List

50-50  
DSS1  
DSS2  
OLTP1  
OLTP2  
OLTP3  
OLTP4  
PROGRESS  
random\_0read  
random\_100read  
random\_read\_100hit  
RRH  
RRM

sequential  
sequential  
SR  
TERADAT.  
Testoltp1

View  
New  
Edit  
Copy  
Delete

Start

<< Add

Remove >>

☒ ALL ☐ User ☐ Std

FIG. 9F

Workload Execution

Workloads: OLTP1

Iterations: 1

☐ Dry Run

Configuration Rule: 1BA-1Port/Proc

OK Cancel

FIG. 9G



RESPONSE TIME WORKLOAD

☒ Edit Workload

Workload Description

Testoltp1

Cancel

OK

Delay

1

Cache Slots

15

Max I/O Second

Auto

Max Test Period

210

Min Test Period

0

Segment 1

1

Multiplier

1

LS seeks

0

Start Byte

0

Response Time

Throughput

Bucket Size

30

Segment 2

3

Disk Extent

0

Max Sequential Count

50

Min Sequential Count

50

Workload Transaction Definition

Size	%Workload	%Hits	%Random	%Read	Align	Align Back
OMB 4KB 0B	50	0	100	100	OMB 5KB 0B	OMB 0KB
OMB 4KB 0B	30	0	100	0	OMB 3KB 0B	OMB 0KB
OMB 4KB 0B	10	0	0	100	OMB 5KB 0B	OMB 0KB
OMB 4KB 0B	10	0	0	0	OMB 3KB 0B	OMB 0KB

Request Size

0

4

0

MBytes

KBytes

Bytes

Alignment

0

5

0

MBytes

KBytes

Bytes

Back Alignment

0

0

0

MBytes

KBytes

Bytes

Insert

Remove

% of Workload

50

% Cache Miss/Hit

100

0

% Sequential/Random

100

0

% Write/Read

0

100

FIG. 9H

## THROUGHPUT WORKLOAD

☒ View Workload

---

Workload Description

random\_100read

Delay 1.0 Cache Slots 0 SPlus Type RT Size 20000

Duration Time 30 Unfrictd RT Multiplier 4 I/O Loops Random Range

Multiplier 4 LSeeks Start Byte Random Range

☒ Collect Response Times  
☐ Report Individual Response Times

OK Cancel

---

### Workload Transaction Definition

Size	% Workload	% Hits	% Random	% Read	Align	Align Back
0 MB 0KB 0B	100	0	100	100	0 MB 0KB 0B	0 MB 0KB

Request Size

0 ▾ 0 ▾ 0 ▾ 0 ▾  
 MBytes KBytes Bytes

Alignment

0 ▾ 0 ▾ 0 ▾ 0 ▾  
 MBytes KBytes Bytes

Back Alignment

0 ▾ 0 ▾ 0 ▾ 0 ▾  
 MBytes KBytes Bytes

Insert Remove

% of Workload

100

% Cache Miss/Hit

0

% Sequential/Random

0

% Write/Read

0

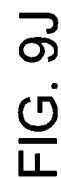


FIG. 9J

**Configuration Definition**

Rule Name:

**Rule Definition**

F/E Expression:  B/E Expression:   
~Expression not yet Defined

F/E Expression:

B/E Expression:

**Front-End**

☒ FA-01:a:0 ☒ SA-16:a:0    
☒ FA-05:a:0 ☒ SA-16:a:1  
☒ FA-12:a:0 ☒ FA-01:a:0

**Back-End**

☒ DA-02:a:C ☒ DA-15:a:C    
☒ DA-03:a:C ☒ DA-02:a:C  
☒ DA-14:a:C ☒ DA-03:a:C

**Expressions**

Max I/O Second:  Auto

**Mirrors**

☒ M1 ☐ M2

**TIDs**

☒ 0 ☐ 1

**LUNS**

☒ 0 ☒ 1 ☒ 2 ☒ 3

FIG. 9K

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

cpq01

..... 000183500055

Hostname cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Benchmark Definition

Benchmark Execution List

All Benchmarks

Profiling Regression

View New Edit Copy Delete

Start

Remove >>

<< Add

☒ ALL ☐ User ☐ Std

FIG. 9L

A screenshot of a software dialog box titled "Benchmark Execution". The dialog box has a standard Windows-style title bar with minimize, maximize, and close buttons. Inside, there are two text input fields: "Benchmark" and "Regression". Below these fields, there is a section labeled "Iterations:" followed by a text box containing the number "3" and a dropdown arrow button. To the right of this section are two checkboxes: "Dry" (unchecked) and "Run" (checked). At the bottom right of the dialog box are three buttons: "OK", "Cancel", and a button labeled "Dry Run".

FIG. 9M

Workload	Configuration Rule	Delay Milliseconds	Cacheslots	MaxIOPs
RRM	1Hyper	-1	-1	
RRM	Everything	-1	-1	
OLTP1	Everything	-1	-1	
OLTP2	3Hypers/4Drives	-1	-1	
OLTP3	1Hyper/2Drives	-1	-1	
DSS1	1Hyper	-1	-1	
DSS2	Everything	-1	-1	
TERADATA	2Drives/DA-3Hyper/4Drives	-1	-1	

Delay	<input type="text"/> 0 <input type="checkbox"/>	Cache Slots	<input type="text"/> 0 <input checked="" type="checkbox"/>	Max I/O Second	<input type="text"/> 0 <input type="checkbox"/>	Bucket Size	<input type="text"/> 0 <input type="checkbox"/>	Max Sequential Count	<input type="text"/> 50 <input type="checkbox"/>
Max Test Period	<input type="text"/> 0 <input type="checkbox"/>	Min Test Period	<input type="text"/> 0 <input type="checkbox"/>	Segment 1	<input type="text"/> 0 <input type="checkbox"/>	Segment 2	<input type="text"/> 0 <input type="checkbox"/>	Min Sequential Count	<input type="text"/> 50 <input type="checkbox"/>
Multiplier	<input type="text"/> 0 <input type="checkbox"/>	LSeeks	<input type="text"/> 0 <input type="checkbox"/>	Start Byte	<input type="text"/> 0 <input type="checkbox"/>	Disk Extent	<input type="text"/> 0 <input type="checkbox"/>		

Workload	<input type="text"/> RRM <input type="button" value="Insert"/> <input type="button" value="Remove"/>
Configuration Rule	<input type="text"/> 1 Hyper <input type="button" value="Insert"/> <input type="button" value="Remove"/>

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

cpq01  
+ ..... 000183500055

Hostname  
cpq01  
Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Results Display

Reports

☒ Runtime  
☐ Nohup  
☐ Exceptions  
☐ DB Summary

View

FIG. 90



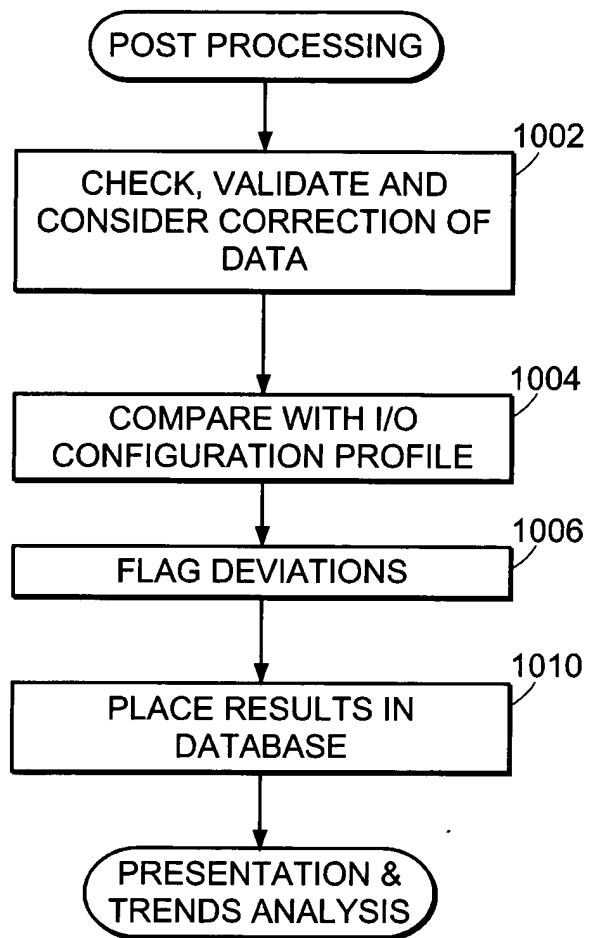


FIG. 10

Advanced Database Simulator Summary

Table Variables

Row config

Column req size

Configuration test type

Test Description none

Summary Functions

IO Function max

MB Function max

OK Cancel

FIG. 10A

Advanced Database Simulator Summary

Table Variables

Row test type

Configuration config

Column interval

Summary Functions

IO Function max

MB Function min

OK Cancel

FIG. 10B

FIG. 11A
FIG. 11B

FIG. 11

FILE DESCRIPTIONS

FILE NAME	DESCRIPTION	HIGHLIGHTS
Char.Summary	SUMMARY FILE OF EACH CHARACTERIZATION TEST BROKEN DOWN BY ITERATION, TEST TYPE, AND CONFIGURATION	
Char.Splus	DATA FILE FEED TO Splus TO CREATE CHARACTERIZATION OBJECTS	
Char.Errors	CHARACTERIZATION ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES.	MESSAGE APPEARS IF ERROR FILE EXISTS
SX.Summary	SX SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX.Splus	DATA FILE FEED TO Splus: USED WITH Char.Summary FILE TO CREATE CHARACTERIZATION OBJECTS	
SX.Errors	SX ERRORS FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS

FIG. 11A



DB.Table	SUMMARY FILE OF EACH DB SIMULATOR TEST BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION		
DB.Splus	DATA FILE FEED TO Splus TO CREATE DBSimulator OBJECTS		
DB.Errors	DB SIMULATOR ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS	
SX_DB.Summary	SX DB SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION		
SX_DB.Splus	DATA FILE FEED TO Splus. USED WITH DB.Splus FILE TO CREATE DBSimulator OBJECTS		
SX_DB.Errors	SX_DB ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS	
Cache Ratio Report	REPORT TRACKING THE CACHE RATIO FROM THE SYM AND THE PROCESSED DATA	REPORT NAME: "CacheRatioReport.txt" LOCATED IN THE RAW DATA FOLDER MESSAGE APPEARS IF A REPORT	

FIG. 11B

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